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An Empirical Study on the Impact of Administrative Monopoly Power Price on Local Energy Efficiency

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Abstract

Energy efficiency in China has a great gap with developed countries. Even among different regions in China, energy efficiency has huge differences. This paper investigates the impact of administrative monopoly power price on regional energy efficiency. Based on the analysis of its conduct mechanism, the empirical section data of various provinces in China in 2006 are used to check the hypothesis of this paper. The finding is that the huge difference in administrative monopoly power price among regions is an important factor impacting energy efficiency, the higher the administrative monopoly power price, the higher the energy efficiency.The artificial inter-provincial barrier in power market and administrative monopoly power price hinders the circulation of power resources among different regions so that there is no efficient allocation of resources all over the country. Besides, it is hard to rectify low allocation efficiency by relying on market force. Regional protectionism and inter-provincial barriers of the power market should be broken to form uniform national power market so that energy efficiency can be enhanced and huge energy saving potentials can be released

Keywords: Administrative monopoly; power price; energy efficiency

1. Introduction

Among different regions in China, energy efficiency has huge differences. With economic growth, power consumption plays a more and more important role in the energy consumption mix in China. The pricing mechanism of marketed coal and planned power reflects the contradiction between marketized coal price and administrative pricing. The power price varies a lot among different regions. The lowest

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average provincial on-grid power price is not half of that with the highest provincial power price. Under the environment that the coefficient of variation of average provincial power price reaches more than 0.2, it bears significant practical meaning to address energy crisis and promote energy saving and emission reduction by exploring the impact of administrative monopoly power price on the regional energy efficiency.

The current literature review on the study of energy efficiency in China can be divided into two categories: the first one is vertical study on the variation trend and impact factors of China's energy efficiency (Sun Peng et al, 2005; Zhou Hong, Lin Ling, 2005; Jiang Jinhe, 2004; Shi Dan, Zhang Jinlong, 2003; Han Zhiyong, et al, 2004; Shi Dan, 1999).The second category of study is to horizontally investigate regional difference of energy efficiency and its impact factors (Zou Yanfen and Lu Yuhai, 2005; Gao Zhenyu, Wang Yi, 2006; Hu and Wang, 2006; Shi Dan, 2006; Wei Chu, Shen Manhong, 2007; Shi Dan, Wu Lixue, Fu Xiaoxia and Wu Bin, 2008).Main conclusions drawn from these study include detection of significant difference of provincial energy efficiency and study on impact factors of provincial energy efficiency differences. As to reasons for huge differences of regional energy efficiency in China, current scholars disagree in terms of study method and influence factors; for example, Zou Yanfen, Lu Yuhai (2005), Gao Zhenyu and Wang Yi (2006) study on the mutual space impact of regional characteristics of energy efficiency resorting to space measuring, clustering and other methods, failing to find out reasons for huge differences of regional energy efficiency. Recently, some scholars attempt to measure energy saving potentials from the perspective of regional power consumption difference (Hu and Wang, 2006; Shi Dan, 2006 et al), but lack deep analysis on the formulation mechanism of energy efficiency differences, incapable of finding out reasons for the impact on energy efficiency; Shi Dan et al (2008) proposes the stochastic frontier production function-based analysis framework of regional energy efficiency differences and measure the role of total factor productivity, capital-energy ration and labor-energy ration in the regional energy efficiency difference, assuming that difference of total factor productivity is the main reason for regional energy efficiency difference. This thesis intends to make the following supplements on the above study: investigate the impact of administrative monopoly power price on regional energy efficiency difference. The layout of this paper is as follows: initially analyze the conduct mechanism of the impact of administrative monopoly power price on regional energy efficiency and proposes the study hypothesis of this thesis; and then establish study model, describe the data used in this paper and carry out empirical study; and then discuss results of empirical study; finally offer conclusions.

2. Conduct Mechanism and Study Hypothesis

Administrative monopoly refers to that government organization exerting public power to restrict or repulse market competition. (Yu Liangchun, et al, 2008). The power pricing mechanism is a non-marketized administrative examination and approval system. The power price based on the principle of 'cost plus' is formulated after administrative examination and approval, which is the essence of administrative monopoly power price. Under the condition of the administrative monopoly power price, price differences of different areas are huge. For example, in 2006, the average coefficient of variation of on-grid power price of each province (municipalities) exceeds 0.2.

The power serves as an important energy input factor; by impacting the economic person's decision-making on input energy factor, the power price further impacts energy efficiency. According to neoclassical economics, the factor input of profit maximization of rational economic person should make the marginal output of any production factor equal to the corresponding marginal cost. The difference of administrative monopoly power price among different regions in China is huge; besides, there are inter-provincial barriers hindering intra-regional circulation; in the region with low administrative monopoly

power price, the marginal output of unit power is definitely less than that in the region with high administrative monopoly power price, incapable of making the most efficient allocation of power resources among different regions, which further impacting the energy efficiency among different regions.

According to the previous analysis, the conduct mechanism of the impact of administrative monopoly power price on regional energy efficiency is summarized as follows: the administrative monopoly power price under the administrative examination and approval system causes differences of regional power price; the inter-provincial barrier in the power market hinders the intra-regional circulation of power resources, leading to the circumstances that the lower the administrative monopoly, the lower the regional energy efficiency.

Based on the above analysis, we propose the following hypothesis:

Hypothesis: the difference of administrative monopoly power price is the important reason for the difference of regional energy efficiency; the lower the administrative monopoly power price, the lower the regional energy efficiency.

3. the Model

In order to carry out empirical inspection on the hypothesis of the impact of administrative monopoly power price on regional energy efficiency proposed in the third part and learn from the existing research results, we assume that energy efficiency-impacting factors include the share of secondary industry, administrative monopoly power price, economic development level, etc.

We carry out initial regression analysis by setting the following measuring model:

$$\text{Energyefi} = \alpha + \lambda \text{Second} + \delta \text{Price} + \theta \text{Develop} + e$$

In the above equation, the explained variable Energyefi refers to regional energy efficiency, whose calculation method: energy efficiency = GDP generated by unit standard coal, unit Yuan/ton standard coal. This variable reflects the share of energy efficiency; the higher the value of this variable, the higher the energy efficiency.

Explaining variables include:

1）Second, the portion of secondary industry, represented by the share of revenue of regional secondary industry on regional production revenue.

2）Price, the average on-grid power price of each province, unit Yuan/thousand kW·h

(3) Develop, economic development level of each province, represented by per capita GDP, unit, Yuan/person.

(5) e refers to stochastic error.

α in the measuring model is constant, λ, δ, θ are coefficients to be evaluated.

Data used in regression analysis are section data of various provinces in 2006, data sources: data of power price in 2006 are the average on-grid power price of various provinces in 2006 by the author's measuring and tidying of average on-grid power price of various provinces in 2005 of Annual Development Report of China's Power Industry 2006 and price index of China's City (Town) Life and Price Annals 2007; the energy efficiency is from the author's tidying of China's Statistics Annuals in 2007 while other data are sourced from 2007 China's Statistics Annuals.

4. the Results

The results are listed in table1. The regression results forcefully supports hypothesis proposed by us: the impact direction of variable administrative monopoly power price is positive and significant; the higher the administrative monopoly power price, the higher the regional energy efficiency, verse versa;

when other factors are controlled, an increment of RMB 1 Yuan per thousand kW·h of administrative monopoly power price, the regional power efficiency enhances RMB 3.3 Yuan/ton standard coal.

Other findings include: (2) the impact direction of variable secondary industry is negative and obvious at 5% level; the higher the portion of secondary industry, the lower the regional energy efficiency; the lower the portion of the secondary industry, the higher the regional energy efficiency; under the pre-condition that other factors don't change, an increment of 1% portion of secondary industry, the regional energy efficiency decreases RMB 14.36 Yuan per ton standard coal, which re-validated the research conclusion that high portion of secondary industry has obvious negative impact on the regional energy efficiency; (3) the impact direction of economic development level on energy efficiency is positive and the impact is obvious at 10% level; the higher the economic development level, the lower the regional energy efficiency while the lower the economic development level, the higher the regional energy efficiency, which is consistent with the existing research conclusions; (4) this empirical study shows that the impact of the portion of the tertiary industry on the energy efficiency is not obvious; based on the current literature, conclusions on the impact of this variable are not totally consistent.

Table 1 the Regression Results

Explained variables / Explaining variables	Regional energy efficiency		
	Coefficient	t value	P>|t|
Administrative monopoly power price	3.335946***	5.02	0.000
Portion of the secondary industry	-10.80976**	-2.14	0.043
Economic development level	0.0072669**	2.03	0.054
Constant	457.5594	0.52	0.827
Adj R-squared	0.6698		
F	19.26 ***		

Note: ***、** and * indicate significance level of 1%，10% and 15% respectively.

5. Conclusions

This thesis analyzes the conduct mechanism of administrative monopoly power price on regional energy efficiency, proposes the hypothesis that the difference of administrative monopoly power price is an important factor of impacting regional energy efficiency and tests the hypothesis with provincial section data in China in 2006.The findings from empirical study are as follows: differences of administrative monopoly power price are an important factor for regional energy efficiency difference; the higher the price of administrative monopoly power price, the higher the regional energy efficiency, verse versa. The administrative monopoly power price hinders the circulation of power resources among different regions so that there is no efficient allocation of resources all over the country. The lower power price in some regions doesn't provide incentives on the improvement of energy efficiency; instead, it stimulates energy waste and great development of high energy consumption industry, unable to promote technological innovation and energy-saving production technology of enterprises with high energy consumption and causing negative impact on the enhancement of energy efficiency. The policy suggestion is that marketization reform of power industry should be deepened and administrative examination and approval system of power pricing should be reformed.

References

[1] Shi Dan. Structure change is the main factor of impact on energy consumption in China [J].China Industrial Economy. 1999 (11):38～43 (in Chinese).

[2] Shi Dan. Regional Difference of Energy Efficiency in China and Energy-Saving Potentials Analysis [J]. Industrial Economy 2007（1）：57～65 (in Chinese).

[3] Shi Dan, Wu Lixue, Fu Xiaoxia, Wu Bin: Regional Energy Efficiency Differences in China and Its Causes Study — stochastic frontier production function-based variation decomposition [J]. Management World. 2008 (2): 35～43 (in Chinese).

[4] Han Zhiyong, Wei Yiming, Fan Ying. Study on China's Energy Strength and Economic Mix Change Features [J]. Application of Statistics and Management. 2004 (1):P1～6,52 (in Chinese).

[5] Jiang Jinhe. Measure Analysis of Energy Efficiency Improvement and Economic Restructuring [J] The Journal of Quantitative & Technical Economics. 2004(10)：32～39 (in Chinese).

[6] Zhou Hong, Lin Ling. Industrial Power Consumption Variation Factor Analysis in China: 1993~2002[J].Industrial Economics Research. 2005(5):13～18 (in Chinese).

[7] Zou Yanfen, Lu Yuhai. Analysis on the regional characteristics of energy utilization efficiency in China based on the space Autoregressive Model [J].Applied Statistics. 2005(10):67～71 (in Chinese)

[8] Gao Zhenyu, Wang Yi: Regional Division of Energy Productivity in China and Analysis on Impact Factors [J]. The Journal of Quantitative & Technical Economics. 2006(9):46 ～ 57 (in Chinese).

[9] Yu Liangchun, Yu Donghua. Study on the measurement of China's Regional Administrative Monopoly in the Transformation Period [R]. Work Thesis of Anti-Monopoly and Competition Policy Study Centre of Shandong University, 2008RBA0004 (in Chinese).